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ABSTRACT

The goals of this study were to replicate the findings produced in a previous conversation simulation study, to examine the conditions whereby persons attribute blame, and to extend the methodology employed in simulation game study. Conversations were simulated by a two-person game in which subjects (46 undergraduate students) were provided a deck of cards comprising an artificial language and a set of rules for action and meaning. The logic of the conversations was manipulated in two versions of the game by changing the complexity and symmetry of the rules. Subject ability to coordinate "conversations" was measured during and after each game for descriptions of the predictability of the partner (intrapersonal) and for each dyad's actual coordination score (interpersonal). The results in general replicated the findings of the previous study. In addition, the results indicated variation in persons' attribution of blame and in the salience of certain variables during the course of a "conversation"; for example, "unpredictability of partner" was highly correlated with several variables at midgame but not with any variables at the end of the game. (Author/RL)

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The Effects of The Structure of Communication Rules on Persons' Simulated Conversations

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ABSTRACT

The goals of this study were: 1) To replicate the findings produced in a previous conversation simulation study, 2) to examine the conditions under which persons' attribute blame, and 3) to extend the methodology employed in the previous simulation game study. Conversations were simulated by a two-person game in which subjects were provided a deck of cards comprising an artificial language and a set of rules for action and meaning. The logic of the conversations was manipulated in two versions of the game by changing the complexity and symmetry of the rules. Subjects' abilities to coordinate their "conversations" were measured at two points in the game and at two levels: 1) Intrapersonal - their descriptions of the predictability of their partner, and 2) Interpersonal - each dyad's actual coordination score. The results in general replicate the findings of the previous study. In addition, the results indicate variation in persons' attribution of blame and in the salience of certain variables during the course of a "conversation". The simulation game constitutes a useful research protocol for understanding the process and effects of conversation.

The Coordinated Management of Meaning (hereafter CMM) developed by Pearce (1976) and Pearce and Cronen (1978) incorporates a systemic rules-based approach in the study of interpersonal communication. The model represents each person as holonic (Koestler, 1967): a system in themselves which is a component of a larger system where their individual actions become part of stable patterns of conjoint actions -- an interpersonal system. In particular, beginning from the argument that individuals' actions are explained by their meanings and not by the events or messages themselves, CMM makes the substansive claim that persons employ dimensions of meaning which vary in degree of cognitive differentiation (Kelly, 1955) and temporal extension (Shank and Abelson, 1977), and which are organized hierarchically (Bateson, 1977). These processes are represented by a hierarchical model shown in Figure 1 (Pearce, Cronen, and Conklin, 1977). The lowest level represents

Figure 1
About here

uninterpreted sensory data. The next two levels refer to information processing: constructs (Kelly, 1955 as modified by Mischel, 1964) and construction systems (Harris and Cronen, 1978). The fourth level refers to speech acts which represents the significance of messages to the relationship between the communicators (Searle, 1969). The fifth level consists of episodes: patterned sequences of speech acts with a beginning, internal structure, and end (Harre and Secord, 1972). The final level of the hierarchy model is that of "life-scripts" (Berne, 1972): patterns of episodes which define central features of the self and models of coherent action. Rules organize the hierarchy.

Two major types of rules with identifiable properties are delineated in the model. Constitutive rules specify how symbols relate to other symbols or phenomena and consist of the operator "count as." For example, "Hello. How are you?" (a speech act) counts as "greeting" (an episode). Constitutive rules occur within and between all levels of hierarchical meaning and contextualized each other. The primitive form of a constitutuive rule may be symbolically expressed as:

$$cR \equiv A \supset Mc_{i..n} \longrightarrow Mc_{j..n}$$

where

A = An antecedent condition, which may include speech acts, episodes, and/or environmental conditions

$Mc_{i..n}$ = Some one or more meaningful construals at level i

$Mc_{j..n}$ = Some one or more meaningful construals at level j

= read "count as"

= read "in the context of"

While constitutive rules integrate the hierarchy, they alone do not guide behavior.

Regulative rules guide sequential action, and thus exist only at the levels of speech acts, episodes, and life scripts in the hierarchy where the meanings have temporal extension. The primitive form of a regulative rule may be symbolized as

$$rR = A \quad (DO)_{i..n} \quad (SPACT/Ep/LS)_{i..n} \quad C_{i..n}$$

where

A = Antecedent conditions

$DO_{i..n}$ = Deontic operator (the operators of deontic logic are: obligatory, legitimate, irrelevant, and prohibited)

(SPACT/Ep/LS) = Speech act, episode, and/or life script

$C_{i..n}$ = Some one or more consequent conditions

= Conditional, "if...then"

= Read "in the context of"

This symbolism may be interpreted as the practical syllogism (von Wright, 1971) as modified by a rule laid on its side (Pearce, 1976). Each of the elements in the regulative rule is the product of constitutive rules, hence contextualized by them. For example, if person 1 says, "Hello. How are you?" which for person 2 has interpreted as the episode "friendly greeting" the following regulative rule may occur:

Friendly Greeting

"Hello. How are you?"	(Obligatory) "Fine. How are you?"	1. Continue conversation; 2. indicate reciprocol concern; 3. confirm the episode.

Regulative rules function for persons as providing means of bridging construed antecedents and intended consequences.

The system by which individuals interpret messages and choose to express their meanings consists of the combination of hierarchical meanings and rules. CMM assumes the hierarchically--organized set of rules for meaning and action develops from individuals' integration of a pre-existing social order as they perceive it.

Individuals' rule sets are juxtaposed when they converse, and as persons produce messages, a larger and more complex system is formed. Specifically, each conversant must produce messages which are interpretable by the other conversant as legitimate extensions of his/her rule sequence up to that point, and as legitimate antecedents of the rest of the sequence which each "predicts" will occur. When conversations are coordinated in this manner, the unit of analysis becomes dyadic and may be explained as "they did X." However, as Pearce and Cronen (1978) note, coordination is neither easy to attain nor sustain. Instead, through time conversations are better described as oscillating, frangible, or uncoordinated action.

Theoretically, Pearce and Cronen have identified three actions where coordination between individuals may become difficult. First, individuals vary in their cognitive differentiation (Kelly, 1955) of events: persons can use different construct dimensions in their interpretations. For example, one conversant using the construct dimension "formal-informal" may interpret "Hello. How are you?" counting as the episode "ritualized greeting" while the other conversant employing the construct dimension "friendly-unfriendly" may interpret the same speech act as the episode "sincere concern." These conversants then will enact different episodes consisting of different regulative and constitutive rules. To illustrate, in the above example person 1 may enact the episode "ritualized greeting" with the regulative rule: if "Hello. How are you?", then (obligatory) "fine" with the anticipated consequence of terminating the interaction. Conversely, person 2 may enact the episode "sincere concern" with the regulative rule: if "Hello. How are you?", then (obligatory) a sequence of speech acts elaborating on one's state of health with the anticipated consequence of enhancing friendship. The meanings may be described as uncoordinated. The variation between persons' cognitive differentiations is inherently linked to variations in the forms of both rules: in content (e.g., "O counts as A" for person 1 while "O counts as B" for person 2 as illustrated in the first part of the above example) and in structure (e.g., "if A, then B" for one person while "if A, then B or C or D for another person).

Differences in individuals' rules structures: 1) variations in equifinality and 2) variations in symmetry -- asymmetry present two additional coordination difficulties. Individual rule structures may vary in complexity ranging from low equifinality ("If A, then B") to a higher degree of equifinality ("If A, then B or C or D). If two persons similarly construe an antecedent condition, then low equifinality in rules structures will probably not be problematic; however, a high degree of equifinality in rules structures places demands on participants' competence (Harris and Cronen, 1978) to make the appropriate choices of acts to achieve a desired conversational outcome. Additionally, when conversants of varying complexity in rules structures interact, the resultant asymmetry in structures can provide difficulties in "coordination." The person with a low equifinal rule structure perceives the only way to achieve the desired consequence when presented with A is to do B, while for the person with a more complex structure, B or C or D can produce the disired outcome. Hence, if the latter person employs C or D, the former person has no appropriate antecedent condition to use in attaining the desired consequence for him/herself. At this point, the conversation becomes "uncoordinated." When two individuals of varying structural complexity interact, the burden of coordination is dependent upon the "more complex" person to "role-take" and competently choose the appropriate act so that the expectations of the other are met. The degree of coordination between individuals' rule sets during conversation is a function of symmetrical content and structure.

The ranges in equifinality and in symmetry--asymmetry between individuals' rule structures in an interpersonal system produce "logical force," a hypothetical construct in CMM. Theoretically, logical force is linked not only to the interpersonal system of rules, but linked to the form of conversation they produce also. Specifically, as communicators exchange messages, each person's act (interpreted by constitutive rules) becomes the antecedent condition for the other s constitutive and regulative rules, which contextualize and describe the appropriate acts for him/her to perform, which then become the antecedent conditions for the first's next act, etc. The sequence of acts produced may be described as "logical" given the rules of the interpersonal system. "Logical force" describes the variety of act sequences that are generated by the juxtapostion of particular rule sets. The "amount" of logical force may be described as the inverse number of legitimate sequences

emanating from a particular interpersonal system, and the force felt directly as particular sequences are obligatory or prohibited as one follows the rules.

A major postulate of CMM is that content and structure of the juxtaposed rules sets of the conversants produces logical force which is the manifestation of the pre-existing social order and which, in combination with interpretive procedures, affects the form of conversation. The specification of logical force as the consequent of the actors' internalization of the social order permits the question "what conditions affect the occurrence of specified types of conversations?" to be asked more precisely as three related questions:

1) What forms of communication will occur given various logics?

2) Under what conditions will individuals act "illogically?" and

3) When individuals act illogically, what repair/attribution procedures will they use to achieve coherence?

"Coordination": An Analogue to CMM

Previous literature (Pearce, Cronen, Johnson, Jones, and Raymond, 1978) reports the development, rationale, and utility of a two person conversation simulation game "Coordination" which may be described as a pure coordination game (Schelling, 1960). The game functions as an analogue to certain selected aspects of the theory of CMM. The game contains two levels of the hierarchy model: speech acts represented by index cards containing colored shapes and episodes represented as four-turn sequences of speech acts. The representation of speech acts as colored shapes provides two dimensions of cognitive differentiation which are used to vary the contents of regulative and constitutive rules between persons. The contents of the rules are represented as colors or shapes or colors and shapes. Hence, the game provides both manipulation and control of individuals' perceptions of antecedent conditions (in the game, speech acts).

The general forms of the rules are constent with their theoretical description. Constitutive rules take the form: $O \rightarrow A$, or "circle counts as A_x" and function as guides to the meaning of particular "speech acts." Regulative rules take the form: If $\square$, then $\triangle$, or "If square, then (obligatory) triangle $\supset$ C" which function to guide appropriate sequences of "speech acts" to perform the construed episode. In addition to the variations in the contents of the rules, the structures are manipulated to produce variations in equifinality and symmetry--asymmetry between individuals' rule

sets. Rules vary from low equifinality (e.g. "If red, then black") to a higher degree of equifinality (e.g. "If 0, then□or△ or 0"). While the original study employed three forms of the game, the present study used only "Game 2" and "Game 3." Game 2 represents an interpersonal system where the rules of both conversants have a high degree of equifinality, symmetrical constitutive rules, but differ in the content of their regulative rules. The high degree of equifinality in both persons' rule structures places demands on the interactants' abilities to choose the appropriate speech acts in reaching a desired conversational outcome. Game 3 represents an interpersonal system consisting of one interactant with low equifinality in both rule structures, while the other conversant has a higher degree of equifinality in both structures producing a high degree of asymmetry between participants.

The conversation simulation game provides a partial analogue to the theory of CMM. As an analogue, "Coordination" may be employed in a laboratory setting to examine "what conditions affect the occurrence of specified types of conversations?" and its related questions.

Hypotheses

A number of interesting findings in the previous conversation simulation study served to generate hypotheses for the present study. First, Pearce et. al. reported that subjects most easily coordinated their desired outcomes when their rules were simple and symmetrical, and subjects were least coordinated when their rules were asymmetrical in both structure and content. In addition to this support for their main hypothesis, the researchers stated that the asymmetry of structure exerted the most powerful effect. This finding generated the first hypothesis for the present study:

H_1 Subjects in Game 2 will score higher points by producing more desired four-turned sequences than subjects in Game 3

A second finding by Pearce et. al. concerning the locus of blame for coordination problems indicated that subjects rewarded their partners for doing well in a simple game with few choices, but not themselves. However, when the rule structures were more complex and asymmetrical, the tendency to blame the rules was marginally related to "other's competence," but not to "own competence" even though the two variable were closely related. This raises the interesting question of the conditions in which persons blame

external situations or the other person for problems, and in which they meta-communicate to discover the logic of their conversation. A body of knowledge generated by blame attribution theorists employing a measure of internal--external orientation (Rotter, 1967) is pertinent to this question. This construct is defined as a generalized expectancy for an individual to perceive his/her own reinforcements as the results of his/her own behaviors and characteristics or as the result of forces beyond his/her control, such as luck, fate, or powerful others (Rotter, Chance, Phares, 1972). Phares, Wilson, and Klyver (1971) reported that following task failure under non-distractive conditions, externals were more likely to blame in explaining their failures. Davis and Davis (1972) found that externals were more likely to blame impersonal sources (luck) for task failure than were internals; although, the two groups did not differ in giving themselves credit for success. Horchreich (1974) hypothesized that some externals accept their lack of control (congruence) while other externals utilize blame projection as a defensive mechanism for failure. A later study supported this hypothesis (1975). This body of research serves as a basis for the second hypothesis:

H_2 Subjects identified as externally oriented will rate themselves lower in latitude for choice scales and control scales than will internally oriented subjects.

Finally, the previous simulation study discovered that "unpredictability of partner's response" (as a measure of coordination) was a function of game played, perceived latitude for choice, and role-taking ability. Since differences between individuals' rule sets are varied by Games (2 or 3) and Person (1 or 2), the following hypotheses are to be tested:

H_3 Subjects in Game 3 will rate themselves higher on unpredictability of their partner's response than will subjects in Games 2.

H_4 Subjects designated as Person 2 in Game 2 and Game 3 will rate themselves higher in perceived latitude for choice than subjects designated as Person 1.

H_5 Subjects in Game 2 will exhibit better role-taking ability than subjects in Game 3.

The purpose of the present research effort is threefold: 1) to replicate the findings generated by the first simulation game study as a means to determine its reliability as a research protocol; 2) to provide an identification

of internally--externally oriented subjects as a means of prediction for blame projection in an interpersonal problem-solving task; and 3) to extend the experimental methods employed in the first study. In particular, the present study differs from the first study in three major ways. First, while the first study employed "unpredictability of partner" as a measure of coordination, the present study used measures of coordination at two levels: 1) intrapersonal level ("unpredictability of partner") and 2) interpersonal level ("score" which is dependent upon the actual number of desired outcomes produced by the dyad). Second, the measures in the present study were presented to subjects at two points in the game: 1) after two four-turn sequences and 2) at the end of the game to examine variations in the salience of variables across time. Finally, the "conversations" in the present study were extended to four four-turn sequence (allowing 16 plays) whereas in the previous study the four-turn sequences ranged from one to three sequences.

Procedures

Operational Definitions

Independent Variables: The "Coordination" game will take the form of a two-- person, pure coordination, limited information game which will simulate the structure of conversation. Specifically, the game is an artificial communication system consisting of an array of colored shapes which function as messages and an array of capital letters which function as meanings. The logic of the communication system is produced by a set of constitutive rules which link colored shapes to capital letters, and a set of regulative rules which describe legitimate sequences of colored shapes (messages). Cognitive differentiation, equifinality and symmetry--asymmetry in structures are varied within these hierarchical rule structures across two game conditions (see Figure 2)

Figure 2
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Game 2 represents an interpersonal system where conversants have high equifinal and symmetrical rule structures, but the content of their regulative rules are cognitively different (colors versus shapes). Game 3 represents an interpersonal system where conversants equifinality varies from low (Person 1) to high (Person 2), their rule structures are asymmetrical, and their rule

contents are cognitively different.

A second independent variable employed in this study is internal versus external locus of control orientations of the subjects. Subjects were pre-tested using the Internal--External Locus of Control Scale (Rotter, 1966) two weeks prior to the simulation study. These scales have a reported test-retest reliability of .70 over a two week span of time. The data were factor analyzed using varimax rotation procedures. Four factors emerged which were interpreted as: 1) inevitability, 2) success depends on "breaks," 3) politicians' control, and 4) other people control (see Table 1). This finding suggests that the Internal--External Control Scale is multidimensional and not unidimensional as previously reported (Rotter, 1966 and Robinson and Shaver, 1973). Differences in the number of dimensions between the present study and previous studies appear to be the result of differences in employing rotation procedures. However, regardless of this dimensionality issue, Rotter argues that as a unidimensional scale, the Internal--External Locus of Control Scale can be employed to measure subjects' "general expectancies" of control and a number of researchers have utilized successfully his scale for that purpose. Since the Internal--External Scale was incorporated into this study to measure subjects' general orientations, a second factor analysis was conducted specifying a one factor solution (see Table 2). Internal--External Scale questions removed from this analysis were: 1) those which failed to load significantly in previous factor analysis (factor loading $>$ .40) and 2) those items which might produce problems of multidimensionality (i.e., questions pertaining to education and politics). The factor loadings for each question in the one factor solution were used to weight subjects' responses. These weighted item scores were summed and divided by the total number of items in the factor to produce a general internal--external orientation score (range .41 to 4.07). This variable was not manipulated in the experimental treatments, however the internal--external score was utilized as a continuous variable in the post-test statistical analyses.

Dependent Variables: Dependent variables at two levels of analysis were employed. First, the dependent variables latitude for choice, competence, control, and success as perceived by the subjects were operationalized as scores on eight, seven-point Likert-like scales.

1) Latitude for choice: (1) The rules allowed me to make choices.

2) Competence: (1) My partner was extremely competent at playing this game; (2) I was extremely competent at playing this game.

3) Control: (1) Success at coordinating choices in this game is primarily due to luck not skill; (2) Any problems we had were due to the rules we had to work with not our playing ability.

4) Success: (1) My partner and I coordinated our choices well; (2) My partner's choices were extremely unpredictable; (3) This game is extremely easy.

A test-retest reliability procedure using an independent sample from the same population in the previous study reported reliabilities for each scale between .78 and .86.

In addition, subjects were given a form on which they were to record their partner's rules, which was considered a measure of accuracy in role-taking. Role-taking was scored by comparing their partner's actural rules with those written by the subjects. Two judges achieved 100% inter-rater reliability using a 5--point scale in which 1 = subject was unable to write any rules; 2 = subject was able to write at least two regulative or two constitutive rules correctly; 3 = subject was able to write at least two regulative and two constitutive rules correctly; 4 = subject was able to write three regulative and three constitutive rules correctly; and 5 = subject accurately described the other's rules.

Second, the dependent variable success was measured at the dyadic level. Dyad success was operationalized as a score based on the number of desirable four-turn sequences (ABCD) produced by the dyad. These scores ranged from 1 (no desired sequences) to 5 (four desired sequences).

Design of Study

The data were analyzed according to the game played (2 or 3), person (1 or 2), and measures were employed at two points in the game: 1) following the eighth play in the game (or in the middle of the game) and 2) upon completion of the game. Hence, a 2 x 2 MANOVA design was employed. Subjects were randomly assigned to treatment conditions and to same-sex dyads by lot.

Subjects

Subjects consisted of 46 undergraduate students (18 males and 28 females) enrolled in communications courses at an Eastern university in Spring, 1978. The subjects volunteered to participate in the study after requests were made in

their classes. None of the subjects reported playing the game in a previous study.

Materials

Each subject was given three items with which to play the game. 1) a deck of 4" x 6" index cards, each of which contained a colored shape representing the "vocabulary" of the artificial communication system used in the game. 2) a booklet containing a description of the game, instructions, and a worked example. 3) a scoresheet containing the rules which each person was to follow in the game, a specification of the sequence of meanings (e.g., ABCD) which they and their partner were to produce while playing within the rules, and spaces for subjects to record the card played in each turn, its meaning, and the card they expected to be played next.

Method

Two weeks after the subjects had completed the Internal--External Locus of Control Scale, they were assembled in a normally equipped classroom. The experimenter distributed written instructions supplemented by oral information stressing the cooperative rather than competitive nature of the game. In addition, the subjects were informed that no time limit would be placed on their completion of the game and that they should refrain from expressing their reactions to the game verbally or nonverbally. All subjects participated in two practice games to familiarize themselves with the procedures. During the practice game, the experimenter answered any question pertaining to the mechanics of the game. Materials pertaining to the experimental games were then distributed, the game played, the post-test completed, and the subjects debriefed.

Results

Dyads varied considerably in their abilities to produce and reproduce the desired, four-turn sequence within the allotted sixteen turns. Nine subjects (four dyads plus one S) were unable to achieve the desired sequence (ABCD), eleven subjects (five dyads plus one S) achieved the sequence once, nine subjects (four dyads plus one S) twice, eight subjects (three dyads plus two S's) three times, and nine subjects (four dyads plus one S) achieved the sequence four times. The discrepancy in sequences between some players within a dyad is a result of the possibility in Game 3 where Person 2 could produce the desired sequence based upon his/her rules while Person 1 could not.

These results support the assumption that logical force produced by the rules manipulations differed but allowed for the desired sequence to be attained successfully. The variations in logical force between Games 2 and 3 should produce differences in the number of successful outcomes or scores.

The first hypothesis predicted that subjects in Game 2 would score higher (have more successful outcomes) than subjects in Game 3. The data were analyzed using a two-way analysis of variance since final score was of most interest. The results revealed a significant main effect for game played ($F = 6.105$, $p = .018$), (Table 4). The direction of difference predicted in scores between Game 2 ($\bar{x} = 3.476$, s.d. = 1.4007) and Game 3 ($\bar{x} = 2.480$, s.d. = 1.295) was supported. No other main effects emerged, however, "game played" accounted for only 11.6% of the variance of score ($\omega^2 = .116$) suggesting a post hoc analysis of the dependent variable using step-wise multiple regression. Inspection of the results indicated that perceived "competence of other" ($r^2 = .45$) was a stronger predictor of score than "game played" ($r^2 = .116$), (Table 5). Three variables -- "perceived competence of other," "game played," and "role-taking ability" ($r^2 = .04$, $p = .06$) accounted for 60% of the variance in score.

The second hypothesis, concerning the attribution of blame in dyads achieving less than maximum points, predicted that subjects scored as externally-oriented would rate themselves lower on perceived latitude of choice and control scales than would internally-oriented subjects. A test of criterion -- related validity (Kerlinger, 1973) was provided by performing a step-wise multiple regression on "perceived luck versus skill." Logically, if both scales are measuring the same construct, the internal--external orientation score should function as a significant predictor of "perceived luck." The results indicated that the internal--external orientation score failed to emerge as a significant predictor of "perceived luck" at time 1 ($r^2 = .01$) and at time 2 ($r^2 = .004$), (Table 6). Step-wise multiple regression analyses on the other control scale "rules are bad" and the latitude for choice scale "perceived choice" yielded similar results (Tables 7 and 8). The failure to establish criterion--related validity between the internal--external orientation score and the control and latitude for choice scales suggested further statistical analysis of the second hypothesis to be unwarranted.

Hypothesis three predicted that subjects in Game 3 would rate themselves higher on unpredictability of their partner's responses than subjects in Game 2. The results of a multivariate analysis of variance supported the hypothesis.

Subjects in Game 3 were significantly less able to predict their partner's responses than subjects in Game 2 (Hotelling's $T^2 = .2952$, $p = .005$). No significant effects for person or a game by person interaction occurred (Table 9).

Hypothesis four stipulated that subjects participating as Person 2 would rate themselves higher in perceived latitude for choice than subjects participating as Person 1. A multivariate analysis of variance supported the hypothesis. Subjects participating as Person 1 perceived less latitude of choice than did subjects participating as Person 2 (Hotelling's $T^2 = .2081$, $p = .021$; Game 2, Person 1 at T_1, $\bar{x} = 3.000$ at T_2, $\bar{x} = 3.273$; Game 2, Person 2 at T_1, $\bar{x} = 4.500$, at T_2, $\bar{x} = 4.700$; Game 3, Person 1 at T_1, $\bar{x} = 1.197$, at T_2, $\bar{x} = 2.250$; Game 3, Person 2 at T_1, $\bar{x} = 3.538$, at T_2, $\bar{x} = 3.615$). No other effects emerged from the test (Table 10).

Hypothesis five predicted that subjects in Game 2 would exhibit better role-taking ability, than subjects in Game 3. An analysis of variance test did not support the hypothesis ($F = .077$, $p = .783$), (Table 11). The small sums of squares of both Game and Person in the results suggested post hoc analysis. Two significant predictors of role-taking ability emerged from a step-wise multiple regression analysis: (1) Score ($r^2 = .18$) and (2) internal--external orientation score ($r^2 = .09$), (Table 12).

Discussion

An examination of correlation coefficients between all variables at time 1 and time 2 revealed a number of highly intercorrelated measures presenting problems of multicollinearity with several of the regression analyses. To aid in the interpretation of the results, the following procedure was employed:

1) All blocks of highly intercorrelated variables were identified from a table of correlation coefficients (Table 3).

2) When one of the above variables emerged as a significant predictor in the regression analysis, simple correlations were used in the interpretation.

3) When variables not highly interrelated within a block of variables emerged as significant predictors, the regression equations were used in the interpretation.

Although this procedure provided utility in the interpretation of the results, the discussion of the highly intercorrelated variables should be viewed with

some caution.

This study demonstrated the feasibility, utility, and replicability of a conversational simulation game a laboratory experimental research protocol. Through the manipulation of constitutive and regulative rules in an artificial communication system, subjects participated in a conversation -- like task with various amounts of logical force. Subjects' success in achieving coordination was measured, as were the subjects' perceptions of their success, their ability or difficulty in coordination as attributed to luck, themselves, their partner's or the rules of the situation.

The results of the first test hypothesis supported the claim that the manipulation of rules directly affected subjects' abilities to coordinate their actions: subjects in Game 2 (which contained symmetrical rules structures but cognitively different contents between conversants) produced a higher number of successful "conversational" sequences than did subjects in Game 3 (where the rules were asymmetrical in structure and cognitively different in content). However, the amount of variance accounted for by the rules manipulations (game played) appeared to be minimal. This finding seemed to be inconsistent with a previous simulation study which concluded that asymmetricity between rule structures exerts the most powerful effect on individuals' abilities to coordinate their actions. A post hoc analysis of actual coordination (score) using stepwise multiple regression suggested that "perceived coordination," "unpredictability of partner," and "other's competence at time one" and "other's competence" at time two may be functioning as intervening variables mediating the effects of the rules manipulations on actual coordination. The emergence of these variables as significant predictors of other variables in the model tend to support such an interpretation. Two conclusions concerning the rules manipulations appear warranted:

1) The degree of interpenetration of individuals' rules affects their ability to coordinate;

2) Interpenetration is reduced by an asymmetricity in rule structures.

Both conclusions are consistent with the postulates of CMM and previous research.

A test of the second hypothesis attempted to employ the Internal--External Locus of Control Scale as a predictor of subjects' attribution of blame for difficulties in coordination. Factor analysis of subjects' responses on the scale utilizing varimax rotation yielded four factors interpreted as: 1) Inevitability, 2) Success Depends on Breaks, 3) Politicians' Control, and 4) Other

People Control. The emergence of the multidimensional as opposed to the previously assumed unidimensional nature of the scale indicated that subjects' orientations toward an internal versus an external locus of control may be a function of specific domains rather than a generalized belief in luck.

However, on the basis of previous successful research employing the scale as a predictor of subjects' locus on control, the present study constructed a general internal--external orientation score from a single factor solution interpretable as General Belief in Luck. This general internal--external orientation score failed to emerge as a significant predictor of subjects' responses on a "luck versus skill" measure employed in this study. Further analysis revealed non-significant simple correlations between the two measures at either time one or time two. This failure to find criterion-related validity between the two measures indicated two possible interpretations: 1) conceptual flaws in one or both measurements; 2) the two scales are measuring different concepts. While the former interpretation is plausible, the results of this study tend to support the latter. First, the emergence of multidimensional internal--external control judgments from the first factor analytic solution suggested that subjects' general expectancies of internal--external locus of control were domain-specific and hence varied across domains. Second, the failure of the unidimensional general internal--external orientation score to highly correlate with other blame attribution scales ("rules are bad," "other's competence," and "own competence") provided additional support. Future research attempting to measure subjects' orientations toward internal--external locus of control may need to consider the domain in which subjects will be measured. These results, however, need further verification by studies examining situations other than an interpersonal cooperation game.

Although further specific analysis of the second hypothesis was not warranted, an interesting pattern concerning the locus of blame for coordination emerged. While simple correlations between "other's competence," "own competence," and score were significant at both times 1 and 2, "blaming the rules" was related only to "own competence" at time 1 but to "own competence" and "other's competence" at time 2. This pattern suggested that while subjects utilize actual coordination (score) to evaluate their own and other's competence in the midst of a "conversation" they are likely to blame the rules for difficulties they encounter, but not for any difficulties their partner's presented. However, by the end of the conversation, subjects tended to blame the rules for problems that both they and their partners encountered. This poses the interesting question

of the conditions in which persons blame external situations or the other person for problems, and in which they metacommunicate to discover the logic of their conversation. That persons metacommunicate to discover the logic of their conversation appears to occur between the middle and the end of their interaction. However, the process subjects engage in to discover their conversational logic is beyond the scope of the present study.

Results of a multivariate analysis of variance supported the third hypothesis that subjects in Game 3 would perceive their partners as more unpredictable than persons in Game 2. The asymmetricity of rule structures not only produced a stronger effect than content on subjects actual abilities to coordinate their conversations, but, decreased their abilities to predict their partner's next "speech act," especially at time 1. However, upon completion of the game, there were no differences on "unpredictability of Partner" between person 2 in Game 2 and the subjects in Game 3. Unfortunately, an explanation for this occurrence is not readily apparent.

The results of a multivariate analysis of variance supported the fourth hypothesis that subjects in the role of Person 2 would perceive themselves as having a greater latitude of choice than subjects in the role of Person 1. Perceived latitude of choice was strongly related to perceived coordination suggesting persons who perceive more latitude for choice, also perceived greater coordination between themselves and their partners at time 2. Additionally, sex was found to be highly related to "perceived choice." The inverse relationship (males coded as 1, females 2) indicated that females perceived less latitude for choice than males although both sexes were evenly distributed between Persons and Games so that there were no differences in actual latitude for choice or actual coordination (score). One possible interpretation for this finding suggests that males and females use different criterion or criteria to evaluate their perceived latitude for choice. Females may view the rules holistically and perceive a smaller array of "speech acts" available to them than they would prefer while, on the other hand, males may view each rule individually and perceive a more adequate array of rule specified "speech acts" in which to produce the desired outcome. This interpretation is consistent with cognitive style research (Witkin, Dyk, Faterson, Goodenough, and Kaup, 1962) within the qualifications cited by Maccoby and Jacklin (1974a).

The results of an analysis of variance did not support the fifth hypothesis that subjects in Game 2 would exhibit better role-taking ability than subjects in Game 3. No significant differences between Game, Person, or a Game by Person

interaction were revealed. Analysis of the simple correlation matrix between all variables indicated that "role-taking ability" was significantly related to "score," "internal--external orientation," "own competence," and "other's competence." Results of a step-wise regression revealed that both "score" and "internal--external orientation" functioned as significant predictors of "role-taking ability" while "own competence" and "other's competence" did not. A comparison of regression equations between "score" and "role-taking ability" indicated that score was a much stronger predictor of "role-taking ability" than vice-versa, which tentatively suggested that as subjects experience successful outcomes, their role-taking abilities improve. The inverse relationship between "role-taking ability" and "internal--external orientation" revealed that internally oriented subjects either have better developed role-taking abilities or are more likely to engage in role-taking than externally oriented subjects.

In addition to the specific research hypotheses tested in the present study, the report by Pearce, et. al. (1978) of a high correlation between "own competence" and "other's competence" was examined in the present study. Perusal of the simple correlation table revealed significant correlations of .76 at both times 1 and 2 between the two variables which replicates the findings of the previous study. However, analysis of the simple correlation table suggested a more complex set of relationships between "own competence," "other's competence," and other variables at both measurement times. At time 1 both "own competence," and "other competence" were significantly correlated with "unpredictability of partner," "score," "perceived coordination," and "role-taking ability." At time 2, "own competence," and "other's competence" were correlated with "score," "perceived coordination," "role-taking ability," and "blaming the rules." Although complex, these findings as a whole are consistent with the symbolic interactionist position that the self originates in social interaction and implies that it is unlikely that a person will perceive him/herself competent unless he/she has other persons perceived competent with whom to interact successfully.

A final area of inquiry in this study was to examine variations in the relationships between variables at two points in time: 1) at the mid-point of subjects simulated "conversations" (after 8 plays), and 2) at the end of the "conversations" (after 16 plays). A comparison of the correlation matrices between time 1 and time 2 indicated that the relationships between "score," "perceived coordination," "other's competence," "own competence," "role-taking

ability," and "game played" remained relatively stable. However, several interesting variations in relationships between other variables occurred. First, at time 1, "Perceived coordination," was significantly correlated with "Luck" but not "Perceived latitude of choice" while at time 2 the reverse was true. Apparently in the midst of an initial "conversation," subjects perceived coordination of their "speech acts" as partially a function of luck, but toward the end of the "conversation" they perceived coordination as partially a function of their perceived latitude for choice with luck having very little to do with coordination. Second, "unpredictability of partner" was highly correlated with a number of variables at time 1, but not with any of the variables at time 2. This finding suggested that "unpredictability of partner" was a salient variable during the course of a conversation, but as the "conversation" continued, partners became more predictable and the variable diminished in importance. Finally, while "other's competence" and "own competence" were highly related to each other and to a number of other variables, only "other's competence" was significantly correlated with internal--external orientation at time 1 while only "own competence" was related to "blaming the rules." However, at time 2, "other's competence" was no longer related to internal--external orientation and both "other's competence" and "own competence" were correlated with "blaming the rules" as was "perceived coordination." This finding suggests that in the early stages of an initial interaction, the competence of the other person is perceived as partially a function of general luck, whereas one's own competence is partially a function of the rules. As subjects get to "know" their partner's better, the competence of both appears to be more a function of the rules and other variables rather than "general luck."

A number of important implications transcend the present study. The results of the present study may be interpreted propositionally as describing the relationship between the structure of interpersonally juxtaposed rule systems and the <u>form</u> of conversation, thus allowing generalizability across persons and situations in which the specific <u>content</u> of the rules may vary. The replication of results between the present study and the previous simulation study has demonstrated the utility of the game for that purpose. In addition, the simulation game provides a means to examine relationships between variables across time with a high degree of predictive validity, thus allowing a controlled experimental inquiry into the <u>process</u> of interpersonal communication.

While the game "Coordination" makes a useful addition to present research procedures in the communication field, the present study also exemplifies limitations encountered with this type of study. The assumptions underlying systemic rules-based theories make these problems even more salient. These theories often assume several units or levels of analysis simultaneously and multiple inter-relationships between variables within the system. This study employed measures at two levels of analysis: 1) individuals' perceptions of locus of control within the game, self, partner, latitude for choice, and the dyad's level of success, and 2) the actual success of the dyad independent of individuals' perceptions. Several of the measures of individuals' perceptions were highly intercorrelated with each other and with actual dyad success. These highly intercorrelated measures provided multicollinearity difficulties and limitations to interpretation concerning several regression analyses in formulating prediction equations. One approach to addressing this problem is the employment of both large samples and accurate measurements (Blalock, 1972). While the present study replicates the findings of a previous simulation study indicating a high degree of stability of the measures across samples, further research using larger, different samples and testing the accuracy of the measurements is warranted.

Although replicability of results demonstrates generalizability across persons and situations involved in the game, the generalizability of results is limited to the game conditions. Verification of these research results and of this research protocol is in the context of naturalistic studies which focus on the rule structures person actually follow in conversations. The results of simulation studies and naturalistic studies which focus on the relationship between rule structures and the form of conversation will have much to offer an emerging theory of human communication such as CMM.

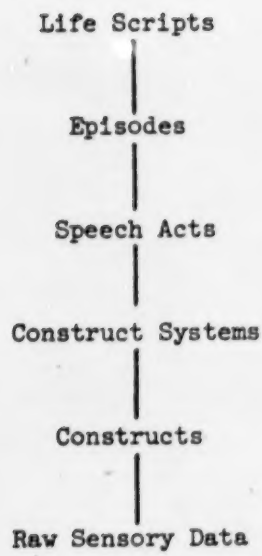


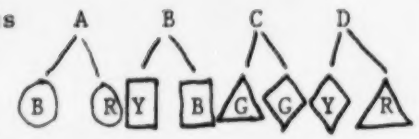
Figure 1: A Hierarchical Model of Meaning

Game 2. Highly equifinal and symmetrical rule structures and cognitively differentiated speech acts (colors or shapes).

These rules appeared as follows:

Person 1

C--Rules



R--Rules

R_1 If ○ Then □

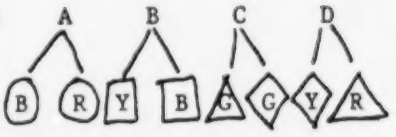
R_2 If □ Then ▭ or △

R_3 If △ Then ◇

R_4 If ◇ Then ○

Person 2

C--Rules



R--Rules

R_1 If red then black

R_2 If black then green or yellow

R_3 If green then yellow

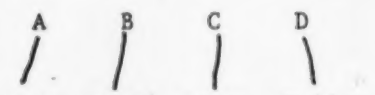
R_4 If yellow then red

Game 3. Asymmetrical rule structures and cognitively differentiated speech acts (colors or shapes).

These rules appeared as follows:

Person 1

C--Rules



R--Rules

R_1 If red then black

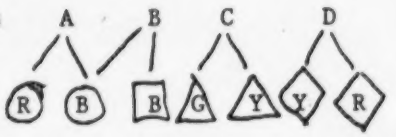
R_2 If black then green

R_3 If green then yellow

R_4 If yellow then red

Person 2

C--Rules



R--Rules

R_1 If ○ then □ or △

R_2 If □ then △ or ◇ or ○

R_3 If △ then ◇

R_4 If ◇ then □ or ○

The "vocabulary" of the artificial communication system consisted of colored shapes here represented by R (red), B (black), G (green), and Y (yellow). In the game, these appeared as colors shaped appropriately. "Empty"shapes indicated that subjects were given rules keyed to shape and ambiguous to color; color labels indicated that subjects were given rules keyed to color and ambiguous to shape.

Figure 2: Rules in the Simulation Games

Table 1

Varimax Rotated Factor Matrix
Internal-External Locus of Control Scale

Questions	Factor 1 Inevit-ability	Factor 2 Success Breaks	Factor 3 Political Control	Factor 4 Other People Control
2. Bad luck	.4890	.0545	-.0657	.0405
3. Always be war	.6150	-.2780	.3380	-.0809
4. Individuals' can get recognition	.0422	-.0186	.2166	.5151
5. Grades influenced by accident.	.2700	.2312	-.0478	.3338
6. Need the breaks to become a leader	-.0904	.4859	.1109	.2383
7. People just don't like you.	.0246	-.0130	-.2247	.0070
9. Fate	.5501	.3464	-.0976	.1194
10. Studying is useless	.3711	.0195	.0438	.2705
11. Need breaks to get a good job.	.0636	.7466	.1366	.2200
12. Powerful people run everything	-.2562	-.1035	.7306	.1203
13. Good or bad fortune	.4176	.0843	-.1720	-.0288
15. Flip of the coin	.3326	.4120	.1609	.1829
16. Need breaks to become boss.	.0598	.4799	.0844	.1079
17. Forces beyond our control	.3370	.0801	.2846	.1185
18. Controlled by accidents	.4589	.5727	.0249	-.1269
20. Can't tell if you are liked	.0392	.0526	.2927	.2242
21. Bad balanced by good	.0147	-.1833	-.0386	-.2580
22. No control over politicians	.0323	.1315	.4235	.0046
23. Grades are mysterious	.3111	.1078	.0896	.1621
25. Little influence over own life	.2753	.5445	.1278	.2399
26. Can't please people	.0072	-.0241	-.0362	.4792
28. No control over own life	.2758	.1542	-.0256	.4595
29. Can't understand politicians	.1597	.1613	.6336	-.0137

Table 2

Internal-External Scale
One Factor Solution

Question	Factor 1 General Belief in Luck
2. Bad Luck	.3112
3. Always be war	.1807
4. Individual gets recognition	.0908
7. People just don't like you	-.0172
9. Fate	.5923
11. Need breaks to get job	.4802
13. Good or bad fortune	.2716
15. Flip of the coin	.6384
16. Need breaks to become boss	.3392
18. Controlled by accidents	.6665
20. Can't if you are liked	.1409
21. Bad balanced by good	-.2626
25. Little influence over own life	.6922
26. Can't please people	.1156
28. No control over own life	.3826
Eigenvalue	2.4890

Table 3

Correlations of All Variables at Time One

	Sex	Game	Person	Internal-External	Score	Role-Taking	Choice	Luck	Other's Competence	Own Competence	Rules are Bad	Unpredictability of Partner
Game	.159											
Person	.000	.044										
Internal-External	-.046	-.059	-.167									
Score	-.132	-.353*	.046	-.108								
Role-Taking	-.115	-.042	.016	-.340*	.419*							
Perceived Choice	-.320	-.236	.377*	.158	.104	-.037						
Perceived Luck	-.113	.162	.000	-.125	-.111	.085	-.148					
Other's Competence	-.180	-.167	.072	-.288*	.626*	.321*	.046	-.157				
Own Competence	-.094	-.088	.023	-.270	.470*	.307*	.100	-.243	.760*			
Rules are Bad	-.067	.075	.013	-.038	.050	-.144	-.117	-.210	.295*	.424*		
Perceived Coordination	-.120	-.198	.172	-.079	.714*	.323*	.215	-.328*	.677*	.654*	.274	
Unpredictability of Partner	.265	.470*	.083	.049	-.706*	-.258	-.221	.156	-.398*	-.271	.167	-.577*

* $p < .05$, $r = .285$

Table 3

Correlations of All Variables at Time Two

	Sex	Game	Person	Internal-External	Score	Role-Taking	Choice	Luck	Other's Competence	Own Competence	Rules Bad	Unpredictability of Partner
Perceived Choice	-.428*	-.242	.331*	.141	.070	.086						
Perceived Luck	.103	.096	-.100	-.060	-.018	-.009	-.148					
Other's Competence	-.133	-.018	.149	-.227	.670*	.342*	-.034	-.135				
Own Competence	-.157	-.041	.257	-.117	.557*	.310*	.111	-.223	.754*			
Rules are Bad	.030	.022	.176	-.240	.240	.048	-.011	-.111	.529*	.475*		
Perceived Coordination	-.121	-.083	.197	-.009	.500*	.252	.368*	-.219	.554*	.552*	.311	
Unpredictability of Partner	.254	.186	.211	-.020	-.275	-.034	-.224	.086	-.163	-.183	.220	-.284

* $p < .05$, $r = .285$

Table 4

Two-Way Analysis of Variance
Score by Game and Person

Source	S.S.	df	M.S.	F	Sign.
Main Effects	11.674	2	5.837	3.104	.055
Game	11.478	1	11.478	6.105	.018*
Person	.348	1	.348	.185	.669
Game X Person	.159	1	.159	.085	.115
Explained	11.833	3	3.944	2.098	
Residual	78.971	42	1.880		
Total	90.804	45	2.018		

Table 5

Step-Wise Multiple Regression of Score at Time One

Step	Variable	F	p	M.R.	S.R.	Beta
1	Coordination	45.875	.000*	.714	.714	.292
2	Unpredictability of Partner	15.471	.000*	.800	-.706	-.436
3	Other's Competence	4.643	.037*	.822	.626	.273
4	Role-taking	2.619	.113	.834	.419	.170
5	Perceived Luck	.684	.413	.837	-.111	.090
6	Game	.752	.391	.840	-.353	.090

Step-Wise Multiple Regression of Score at Time Two

Step	Variable	F	p	M.R.	S.R.	Beta
1	Other's Competence	35.763	.000*	.670	.670	.469
2	Game	11.526	.001*	.752	-.353	-.336
3	Role-taking	3.739	.060	.775	.419	.229
4	Partner Unpredictable	1.324	.257	.783	-.275	-.081
5	Perceived Luck	1.157	.293	.790	-.018	.136
6	Coordination	1.216	.277	.797	.500	.155

Table 6

Step-Wise Regression of Perceived Luck at Time One

Step	Variable	F	p	M.R.	S.R.	Beta
1	Coordination	5.302	.026*	.328	-.328	-.400
2	Sex	2.222	.144	.442	-.133	-.220
3	Role-Taking	1.481	.231	.472	.085	.061
4	Game	1.234	.273	.496	.162	.141
5	Game is Easy	.870	.357	.512	-.244	-.297
6	Internal-External	.772	.385	.527	-.125	-.131

Step-Wise Regression of Perceived Luck at Time Two

Step	Variable	F	p	M.R.	S.R.	Beta
1	Game is Easy	2.621	.113	.237	-.237	-.273
2	Perceived Choice	1.282	.264	.289	-.148	.020
3	Score	.502	.482	.307	-.018	.331
4	Own Competence	.856	.360	.336	-.223	-.149
5	Game	.833	.367	.362	.096	-.174

Table 7

Step-Wise Regression Of Rules Are Bad
At Time One

Step	Variable	F	p	M.R.	S.R.	Beta
1	Own Competence	9.640	.003*	.424	.424	.373
2	Partner Unpredictable	5.013	.030*	.515	.167	.450
3	Role-taking	3.462	.070	.567	-.144	-.310
4	Coordination	2.779	.103	.604	.275	.342
5	Perceived Choice	1.603	.213	.624	-.117	-.252
6	Sex	2.339	.134	.651	-.067	-.222
7	Perceived Luck	.642	.428	.658	-.210	-.125
8	Score	.110	.742	.659	.050	.067
9	Game is Easy	.084	.774	.660	.104	-.061
10	Internal-External	.083	.776	.661	-.039	-.044

Step-Wise Regression of Rules Are Bad
at Time Two

Step	Variable	F	p	M.R.	S.R.	Beta
1	Other's Competence	17.130	.000*	.529	.529	.482
2	Partner Unpredictable	6.669	.013*	.614	.220	.385
3	Role-Taking	1.553	.220	.632	.048	-.265
4	Internal-External	1.687	.201	.650	-.240	-.243
5	Own Competence	2.101	.155	.672	.475	.278

Table 8

Step-Wise Regression Of Perceived Choice at Time One

Step	Variable	F	p	M.R.	S.R.	Beta
1	Person	7.296	.01*	.377	.377	.462
2	Sex	5.815	.02*	.494	-.320	-.200
3	Game is Easy	2.801	.102	.540	-.226	-.430
4	Partner Unpredictable	6.198	.017*	.620	-.221	-.315
5	Perceived luck	3.288	.077	.657	-.148	-.175
6	Own Competence	1.209	.278	.670	.100	.383
7	Rules are Bad	2.004	.165	.690	-.117	-.221

Step-Wise Regression of Perceived Choice at Time Two

Step	Variable	F	p	M.R.	S.R.	Beta
1	Sex	9.841	.003*	.428	-.427	-.353
2	Person	6.638	.013*	.540	.331	.378
3	Coordination	4.381	.042*	.600	.368	.385
4	Other's Competence	8.493	.006*	.685	-.034	-.355
5	Game	1.974	.168	.703	-.242	-.169
6	Partner Unpredictable	.808	.374	.710	-.224	-.194
7	Internal-External	.603	.442	.715	.140	.167

Table 9

Manova of Unpredictability of Partner
Game by Person

	Time 1		Time 2	
Game 2	$\bar{X}$	SD	$\bar{X}$	SD
Person 1	1.818	.982	1.727	1.009
Person 2	2.200	1.033	3.700	2.214
Game 3				
Person 1	3.667	1.823	3.500	2.111
Person 2	3.769	2.843	3.308	1.974

Hotellings T^2

Effect	Value	Approx. F	H.D.F.	Sign.
Game	.2952	6.0516	2	.005*
Person	.0513	1.0520	2	.358
Game x Person	.1076	2.2060	2	.123

Table 10

Manova of Perceived Latitude for Choice Game by Person

	Time One		Time Two	
Game 2	$\bar{X}$	SD	X	SD
Person 1	3.000	1.844	3.273	1.737
Person 2	4.500	2.121	4.700	2.058
Game 3				
Person 1	1.917	1.165	2.250	1.485
Person 2	3.538	2.222	3.615	2.329

Hotellings T^2

Effect	Value	Approx.F	H.D.F.	Sign
Game	.0870	1.791	2	.180
Person	.2081	4.266	2	.021*
Game x Person	.0174	.0174	2	.983

Table 11

Anova of Role-Taking Ability
Game by Person

Source	S.S.	df	M.S.	F	Sign.
Game	.159	2	.059	.077	.783
Person	.027	1	.027	.013	.909
Game x Person	.000	1	.000	.000	.995
Explained	.181	3	.060	.029	.993
Residual	86.971	42	2.071		
Total	87.152	45	1.937		

Table 12

Step-Wise Regression of Role-Taking Ability

Step	Variable	F	p	M.R.	S.R.	Beta
1	Score	9.348	.004*	.419	.419	.368
2	Internal-External	5.110	.029*	.513	-.340	-.397
3	Game is Easy	3.107	.085	.560	-.002	-.354
4	Own Competence	2.343	.134	.592	.310	.275
5	Rules are Bad	1.244	.271	.609	.048	-.289

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